

AP Biology, Semester 1
Unit Quiz: Welcome to Biology
Instructor Version

Section I: Multiple-Choice Questions

Answer Sheet

1.	E
2.	A
3.	D
4.	D
5.	A
6.	D
7.	E
8.	E
9.	D
10.	B

11.	A
12.	C
13.	B
14.	A
15.	E
16.	C
17.	B
18.	C
19.	E
20.	C

Section II: Free-Response Questions

Time Limit: You have 30 minutes to complete this section. Both questions are weighted equally, so allow around 15 minutes for each question. You may move back and forth between questions until time is called.

Scoring: 20 points each, 40 points total

Directions: Answer each of the questions in essay form. Outline form is not acceptable. Labeled diagrams may be used to supplement your answer, but a diagram alone is insufficient. Read each question carefully before you begin to write your answer.

Note - the student's answers should be in prose form, not outline form; tables are presented here to assist grader in identifying important elements of each answer.

1. Macromolecules are high-molecular-mass molecules that are often polymers of simple organic monomers such as amino acids or monosaccharides.

Identify two important functions of macromolecules, and explain the relationship between a macromolecule's structure and function using examples from two different classes of macromolecules.

ANSWER:

	Function: energy	Function: structural support	Function: transport
examples to use	carbohydrates: starch or glycogen fats: triglycerides	polysaccharides: cellulose or chitin (fibrous) proteins: collagen or alpha-keratin fats: membrane phospholipids	this would not be a good choice of function because the unit really only discussed the transport function of proteins (transport by lipid aggregates or vesicles isn't introduced until Unit 2)
relationship between structure and function	key idea is that energy-storage molecules tend to be dense	molecules form long extended structures that can associate with one another (collagen helices, alpha-keratin protofibrils, h-bonded cellulose or chitin strands)	transport molecules (proteins) tend to be globular rather than fibrous; tertiary structures incorporate a site where a small molecule binds and is carried to its destination

2. The search for evidence of life on other planets often includes the search for water, since water is so central to life on Earth. Water has unique chemical properties that give rise to its physical properties, including adhesion, cohesion, surface tension, density in the solid phase, and specific heat.

Select two of water's physical properties, describe it in detail, identify the underlying chemical properties of water that explain each physical property, and describe the consequences of this physical property for living systems.

ANSWER:

PROPERTY:	Description of property:	Chemical properties that explain physical property	Biological consequences of property:
Adhesion	Definition: the attractive force between molecules in one phase, such as liquid, and different molecules in another phase, such as solid	polar structure of water enables hydrogen bonding between water molecules and polar groups on other biomolecules	Adhesion between water molecules and the molecules in tubelike structures in the tree trunk helps transport water from a tree's roots to its leaves.
Cohesion	Definition: the attractive force between similar molecules in the same phase	can be thought of as the sum of all the hydrogen bonds in a collection of water molecules	Cohesion helps hold a column of water together against the force of gravity so that water can be transported from a tree's roots to its leaves.
Surface tension	Definition: the energy needed to increase the surface area of a liquid by a given amount	The molecules on the surface of water are held together by hydrogen bonds. These bonds are strong enough to withstand the forces applied by an organism, up to a certain point.	Surface tension allows very lightweight organisms (such as water bugs) to walk on water. It also explains why drops of water are spherical.

Density of solid vs. liquid	Description: ice is less dense than water, which is unusual in that most substances are more dense in the solid phase than in the liquid phase	h-bonds in ice are longer than they are in water, so molecules are farther apart; entire structure occupies more volume for a given mass, so density is less than in liquid phase.	- ice floats so ponds and lakes don't freeze solid - ice on top of water insulates the water below
Specific heat	Definition: the amount of heat needed to raise the temperature of a 1-gram sample of a substance by 1 degree Celsius.	Extensive hydrogen bonding between water molecules means that when heat is added, much of the heat energy is used to disrupt hydrogen bonds rather than raise the temperature of the liquid.	- human body is relatively resistant to temperature changes - bodies of water are relatively resistant to temperature changes so aquatic organisms have a more stable environment